

The role of mineralogy: Case studies from Austr(al)ia

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The role and value of mineralogy in geosciences and material sciences have recently been hotly debated. In particular, the contribution of this long-established discipline in modern science and academic education has been questioned. So, what will mineralogy be focused on in the future, especially in the light of fundamental vs more applied perspectives? A closer look on mineralogy and the linked fields of crystallography, geochemistry and petrology, indicates interdisciplinary knowledge among the highly diverse fields of expertise to be key to an advanced process understanding in the various facets of human kind, climate change, resource scarcity, and technical challenges (Fig. 1).

In this contribution, various aspects of kinetic and equilibrium water-rock/mineral-gas interactions in low temperature settings are discussed, which are of high relevance for geo- and material scientist's present and future works. Focus is given on the assessment, identification and quantification of fundamental reaction mechanisms of mineral formation, dissolution, and transformation, tailoring/conditioning of (geo-)materials, and advanced understanding of the Earth system evolution throughout space and time. Case studies presented herein comprise of (i) carbonate vein infillings of vertical fractures (Erzberg), (ii) carbonation and external sulphate attack on concrete/shotcrete (Bosruck), (iii) (de)contamination/stabilization of soils using novel nZVI-bentonite nano-composites (Stadtschlaining), and (iv) environmental reconstruction of seawater chemistry by previously unrecognized archives (glauconites from the Arrowie and Amadeus basins, Australia). Recent advances in the analytical toolbox of mineralogists and (isotope) geochemists, such as in-situ Rb-Sr dating via LA-ICP-MS/MS, high-resolution optical imaging, and SEM-based automated mineral mapping, are highlighted, which offer new perspectives in geosciences and material sciences.

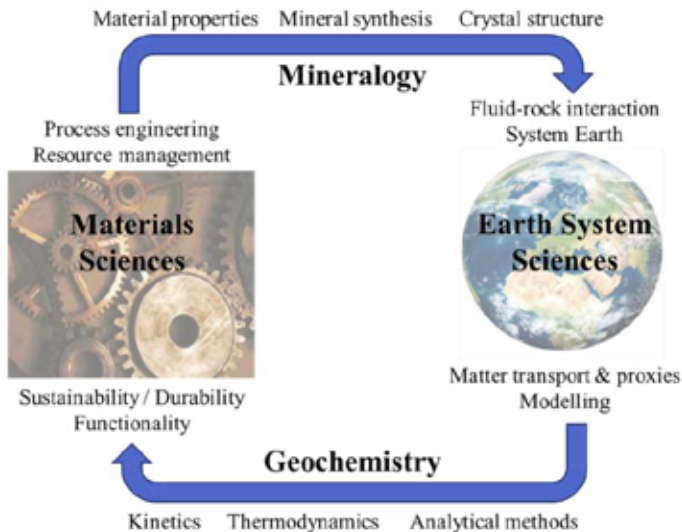


Figure 1. The role of mineralogy/geochemistry in geosciences and material sciences.